Small Business Innovation Research/Small Business Tech Transfer

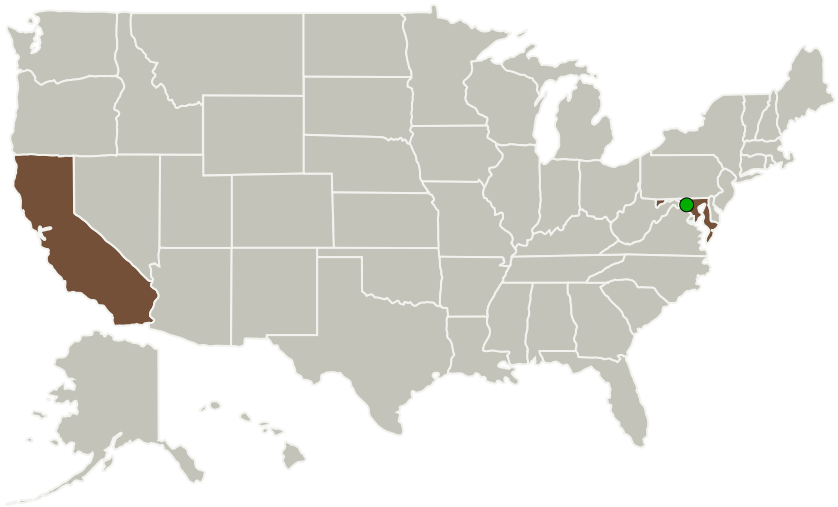
Rad-Hard Sigma-Delta 3-Channel ADC for Fluxgate Magnetometers, Phase I

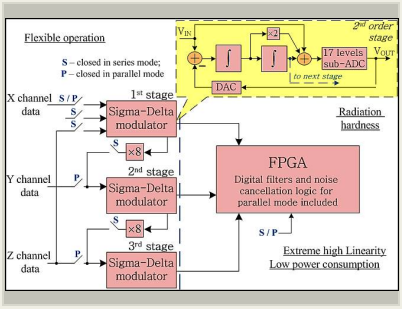
Completed Technology Project (2014 - 2014)

Project Introduction

The proposed project aims to develop a multi-channel analog to digital converter (ADC) required for a fluxgate magnetometer (EPD) employed on NASA's planetary exploration missions. The ADC has to feature very high resolution, radiation hardness (tolerance to SEE and TID), low power consumption and be suitable for operation over a wide temperature range. The proposed 3-channel sigma-delta ADC will be a wide-tunable device which will achieve resolution from 17 to 23.5 effective number of bits (ENOB) at 51.2kS/s rate. The combination of the innovative reconfigurable architecture and low distortion topology will permit to optimize the ADC's power consumption within a wide range and to ensure 3.5fJ figure of merit (FoM). The offset cancellation technique will be implemented to the ADC to solve the offset problem common to all magnetometers. Radiation hardening techniques such as RHBD, RHBL and RHBS will be employed. The proposed novel 17-level sub-ADC's topology requires two times fewer comparators than classic topology, which also helps to save power and to reduce the on-chip area. The ADC will be implemented using IBM's deep submicron SOI CMOS technology with connected body option. Phase I work will provide the proof of feasibility of implementing the proposed ADC. Phase II will result in the silicon proven ADC's prototypes being ready for commercialization in Phase III.

Primary U.S. Work Locations and Key Partners





Rad-Hard Sigma-Delta 3-channel ADC for Fluxgate Magnetometers Project Image

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Organizations Performing Work	Role	Type	Location
Pacific Microchip Corporation	Lead Organization	Industry	Culver City, California
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
California	Maryland

Project Transitions

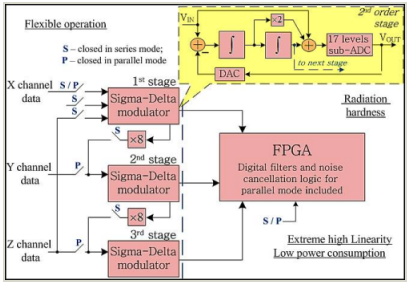
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140575)*

Images



Project Image
Rad-Hard Sigma-Delta 3-channel ADC for Fluxgate Magnetometers Project Image *(https://techport.nasa.gov/image/133063)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Pacific Microchip Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

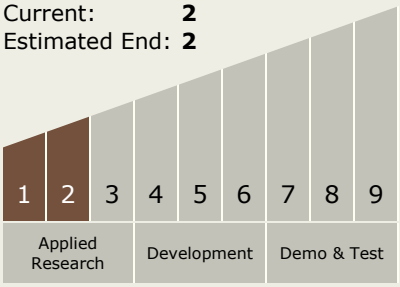
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Dalius Baranauskas

Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **2**



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Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.1 Avionics Component Technologies
    - TX02.1.6 Radiation Hardened ASIC Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System